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Sales and Marketing

Green Initiatives and Electric Hybrid Fire Apparatus

- Idle Reduction Systems
  - What are they?
    - These systems are essentially just additional battery packs that provide power to the trucks basic “on-scene” functions (warning/scene lights, HVAC, other 12V ancillary systems)
  - Why are they beneficial?
    - The battery packs act as substitute the to 12V power provided from a truck’s alternator when the diesel engine is running. Allows departments to have some basic capabilities while at an incident without needing the engine to be idling.
    - Reduced engine idle times on scene lead to less engine noise while on-scene, reduced emissions, less frequent DPF regenerations, and reduced fuel consumption.
- Electric Hybrid Fire Apparatus
  - What is our competition offering?
  - Who is purchasing or showing interest in these types of units?
  - How does market share and pricing effect Sutphen’s position?

Pierce Idle Reduction Technology

- Lithium-ion battery pack tied into and controlled by the Command Zone multiplex system.
  - Truck must be multiplex and have the Pierce Command Zone in order to have this option.
- Batteries are charged via the alternator or a dedicated 30-amp shoreline at the customer's fire station.
- Capable of providing 150 amps at 12V for up to one hour before built in safety interlock auto-starts diesel engine to begin powering via the alternator and recharging the batteries.
- System automatically starts when all safety interlocks are satisfied for 5 minutes.
- Safety interlocks are:
  - Cab is lowered and locked
  - Battery and ignition are on
  - Engine is running
  - Pump is not engaged
  - Parking brake is set
  - Transmission is in neutral

Pierce Electric Hybrid Fire Apparatus

Pierce Volterra

- Only one “in-service” prototype as of December 2021 which is in Madison, WI.
- Pierce owns the vehicle and is lending it to the department for two years in exchange for daily and weekly data dumps.
- A second unit is scheduled to be delivered to the City of Portland, OR in spring of 2022 as part of new JDA.
- Projecting a “full roll out” in 2023.
- 155 kWh battery pack designed around 24-hour duty cycle data received from Madison Fire Department.
- Estimated 70–80-mile range.
- 500 gallons of water, 1500 GPM rated pump.

Pierce Electric Hybrid Fire Apparatus

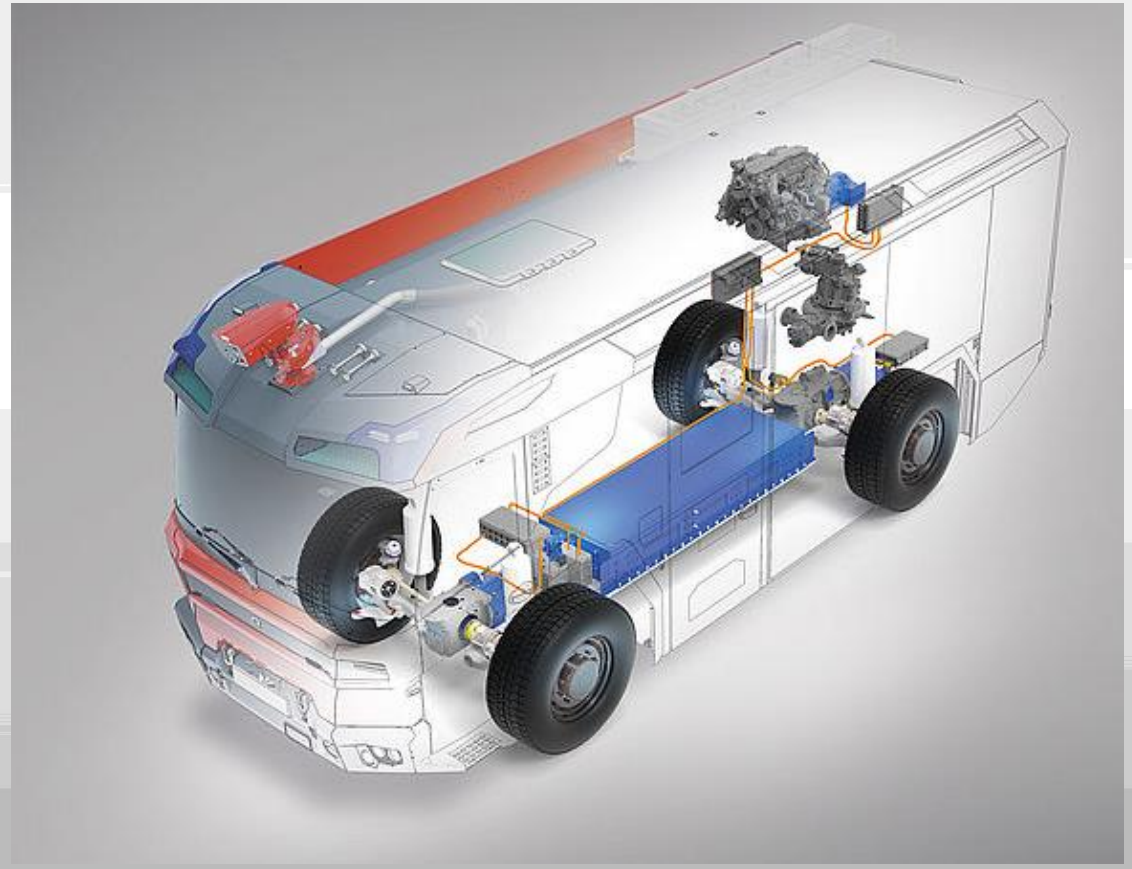
Pierce Volterra

- Electrical power comes from two strings of seven lithium-based batteries, which have an expected life of 14 years.
- Batteries are stored in a compartment behind the cab and ahead of the pump module.
- Batteries can be charged from zero to 100 percent in 90 minutes.
- Current DC charging system used in Madison, WI was developed by the local utility company.
- Contain Cummins B-series motor, which is not tied to the drivetrain.
    - No space savings in the cab.
    - Unclear how the auxiliary equipment is being powered (diesel motor or other).

Rosenbauer *Electric* Hybrid Fire Apparatus

Rosenbauer RT (Revolutionary Technology)

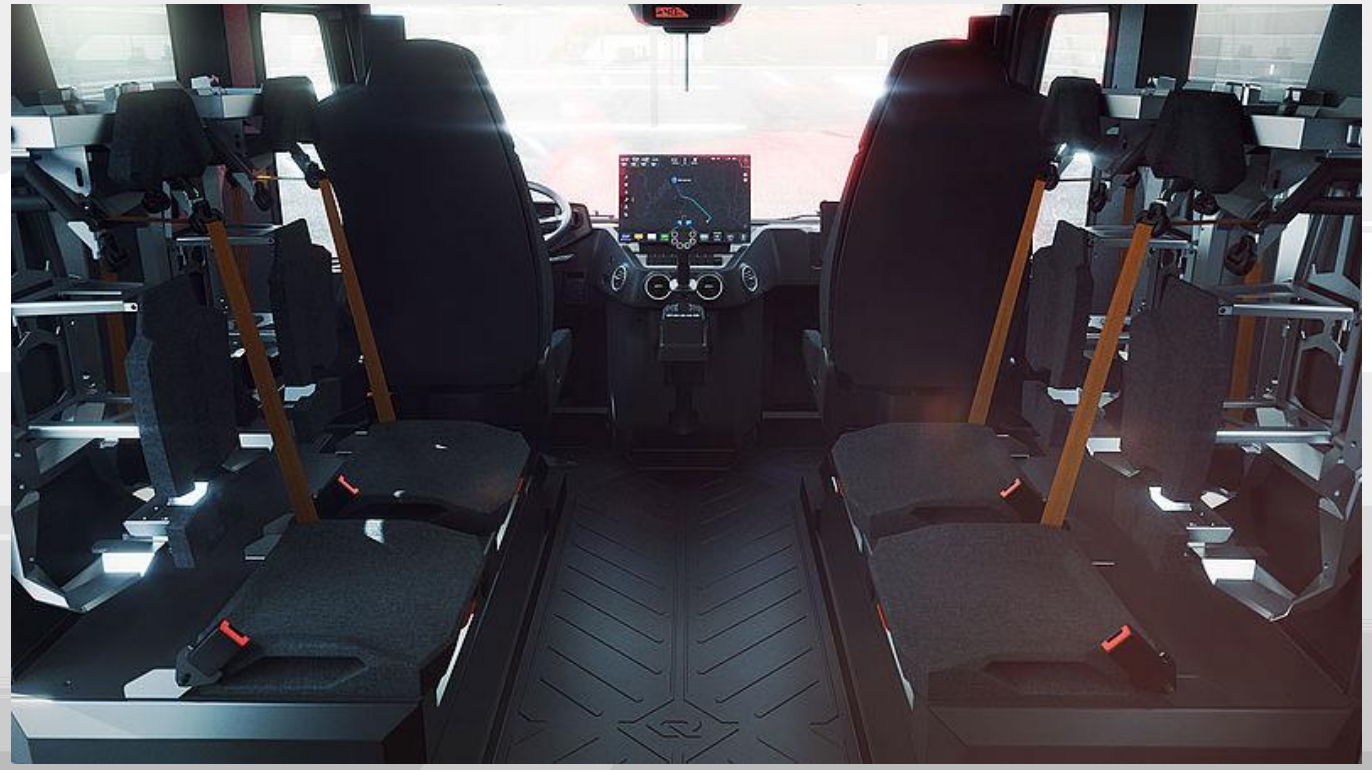
- Test prototypes have been delivered to Berlin, Amsterdam, and Dubai.
- Detail engineering being completed on LAFD.
  - Design modifications were required in order to meet NFPA and FMVSS standards.
- Currently 15 “firm” orders worldwide with an additional 20 “reservations”. Planning for 9 demo units as well.
- Units to be manufactured in Leonding, Austria with series production starting in Q1 of 2022.
- Design is more broadly focus on technology rather than just electric drive/pump capabilities.



Rosenbauer Electric Hybrid Fire Apparatus

Rosenbauer RT

- Partnered with Volvo-Penta to design and implement the hybrid electric drive system.
  - Utilizes 4 separate electric drives (two for propulsion, one for range extension, and one for powering a small water/foam pump).
- 50 and 100 kWh battery configurations (one and two cell)
- Very little useable compartment space.
- Only available with 500 or 750 GPM pump, which must be powered by the diesel engine.



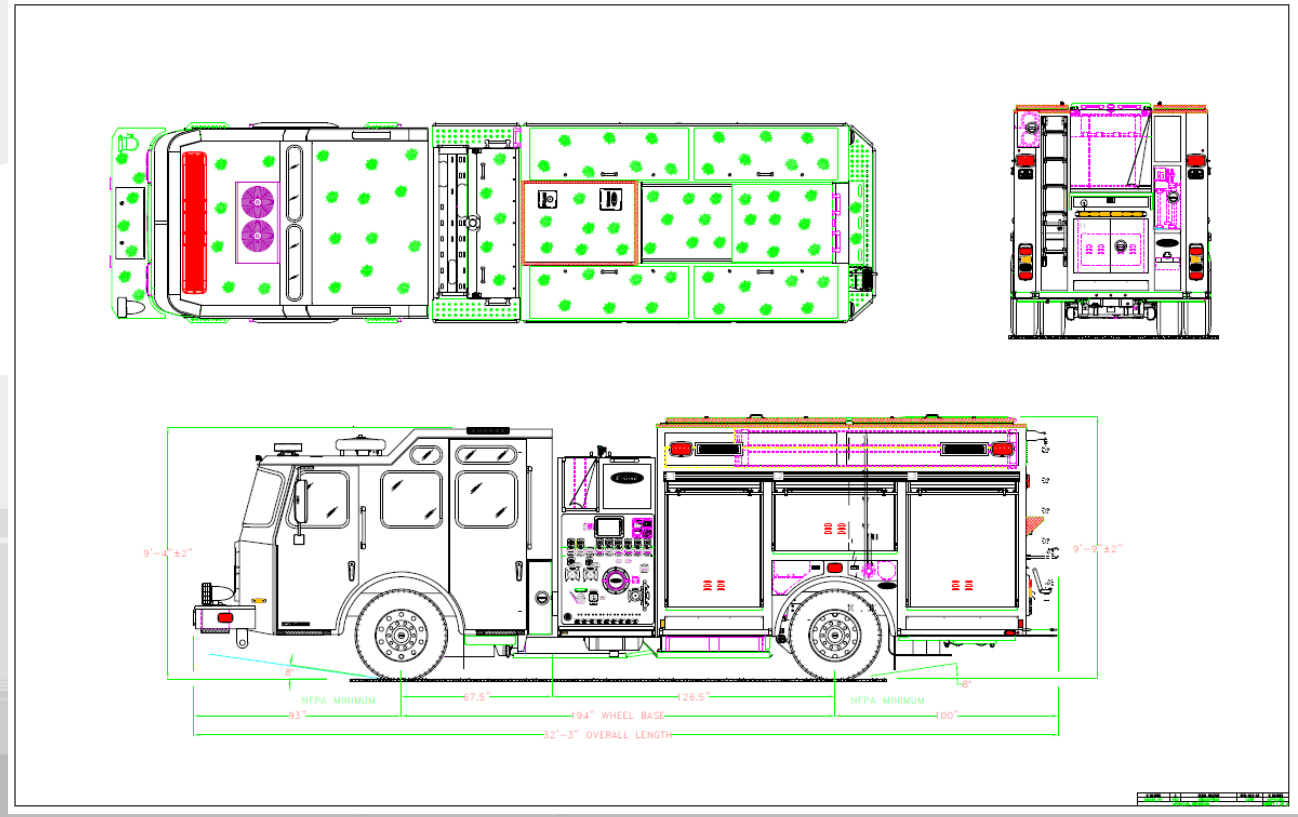
E-One Eco Idle-Tec Idle Mitigation System

- Developed through partnership between REV Group Fire Division and ZeroRPM.
- Utilizes lithium iron energy modules (batteries) to provide power to electrical components (warning lights, scene lights, cab heating and/or cooling, etc.) without the engine running.
    - Cab cooling is achieved through a 120V auxiliary cab A/C unit. This is an additional option to the system and can require larger or additional energy modules based on technical requirements.
- Batteries are charged through either the onboard alternator (at least 400 amp) or the shoreline (80 amp) at the fire department's station.
- Auto start/stop of diesel engine based on safety interlocks and power drop conditions respectively, like the Pierce system.
- Energy modules come with a 5-year warranty.

REV Group Electric Hybrid Fire Apparatus

E-One Vector

- First unit sold to Mesa, AZ
- Available for delivery in 2022.
- Currently developing a functional prototype. Plans to be showcased at FDIC 2022.
- 316 kWh of automotive grade batteries
- Electrical drive/pump system was developed by a European based company “Emergency One”, with no relation to E-One or REV Group.
- Chassis is shipped to Scotland to have system installed before being shipped back to US for final assembly.

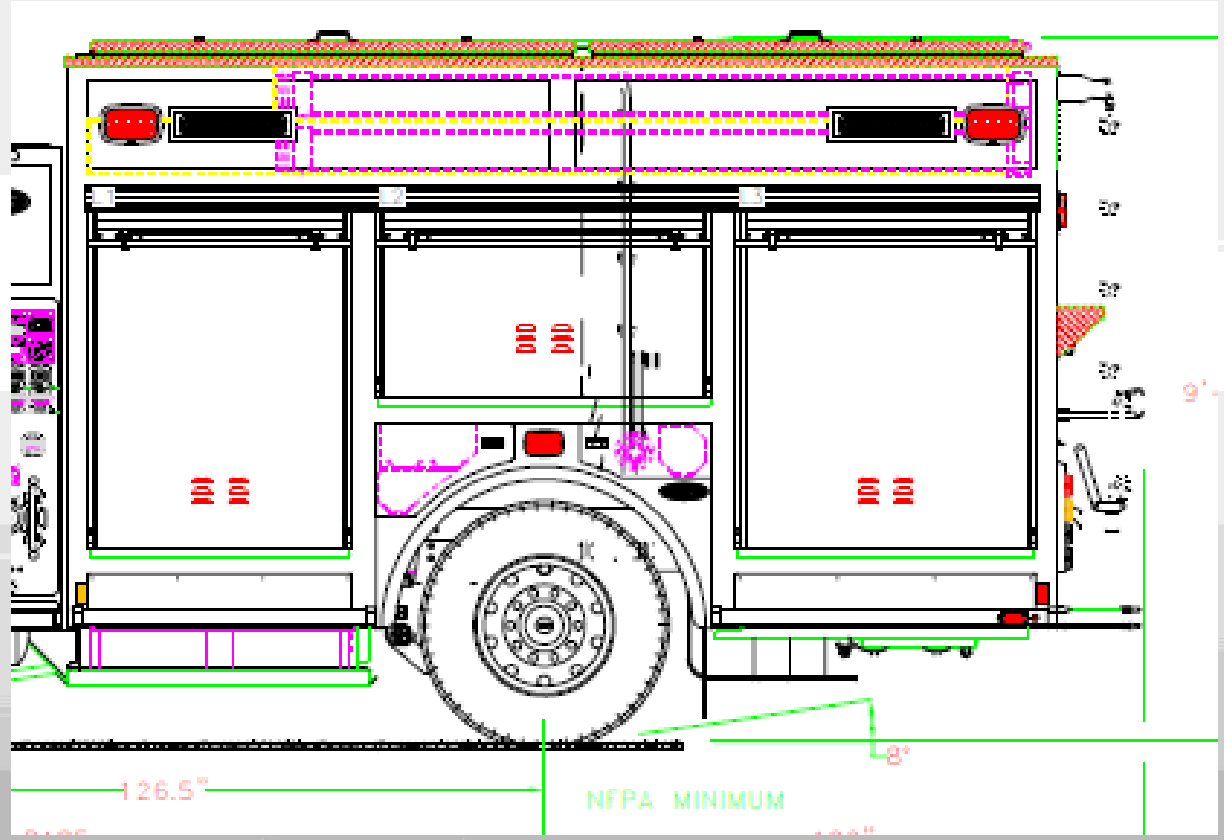


REV Group Electric Hybrid Fire Apparatus

- Referring to the bare chassis with electrical system as the “skateboard”.
  - Designed around one specific wheelbase of 194”. The only cab option is the 67.5” E-One Cab.
- Module width is fixed. Different crosslay configurations are available, but overall footprint is fixed.
- Base body configuration is a rescue style with hatch compartments and can carry 500 gallons of water.
  - Mesa, AZ body appears to have a two-arm ladder rack in lieu of ladder chute.
- Major system components include a 120-kW diesel generator and a 500 HP electric drive.
- Drive utilizes 700V electrical cabling.
- Electric drives tie into the pump transfer case ahead of the pump.
- Pump is a 1250 GPM rated Waterous.
- On a full charge, the batteries will operate the pump at 1250 GPM for 2.1 hours.
  - Per NFPA, manufacturers are allowed to refuel during the standard 4-hour pump test. REV interprets “recharge” and “refuel” as the same, which is why they are saying it can complete a 4-hour NFPA pump test on electric power.
- Battery life is 2000 cycles. Equates to about 5 years if charged everyday.

REV Group Electric Hybrid Fire Apparatus

- Batteries are located under the R1/L1 and R3/L3 compartments. Promotes lower, safer center of gravity.
- Battery thickness is about 12 inches, which result in a loss of compartment space by raising the bottom sill of the compartments up.
- Battery replacement similar to the Tesla design (drop/slide out from the bottom).
- Braking system charges the batteries like consumer hybrid vehicles. Highway range is around 100 miles, without regenerative charge from braking.
- “Extender” design utilized diesel engine runs the generator which charges the batteries to power the drivetrain and pump.



Competition Electric Hybrid Fire Apparatus – Cost

- All these units are reported to have a selling price in the $1.2 – 1.4 million range.
- REV Group
  - Charging station cost is $65K. This does not include the cost to run 480V, 3 phase power into the station. In many cases this will require the power company to branch off the main line and install a 480V transformer specifically for the station.
  - Battery replacement cost is around $200K. This is partially because all the electrical drive system cabling must be replaced when the batteries are replaced.
- Charging stations for all these units requires special consideration from local utility providers.
- Service/Fleet maintenance facilities will also need to have infrastructure upgrades to support new charging stations.

Competition Electric Hybrid Fire Apparatus – Summary

- At this point the entrance to market capital is substantial with only a handful of departments nationally that have the funding to justify this level of expense.
- Current designs contain everything you would see on a regular custom pumper except an Allison transmission.
- Fleet and maintenance expenses are significant considering costs to install these new charging systems in addition to the typical maintenance of the diesel engine, DEF system, 12V batteries and other auxiliaries.
- Current market share is minimal. Return on investment is very far down the road until technology improves, and proper infrastructure is put in place on a broader base.

Sutphen “Green Initiative” Market Stance

- Sutphen has embraced various options in Idle Reduction technology. We feel that Idle Reduction technology bridges the gap between the fully electric fire truck and the current combustion engine.
- This technology helps to mitigate and limit the amount of carbon emission into the atmosphere by using a smaller engine or Lithium-Ion batteries to replace the intermittent use of the larger diesel engine while the truck is idle on scene.
- With the current state of the market, and the transition to fully electric fire trucks, we feel that taking baby steps into newer technologies has been the steady approach to a market that is slow to embrace change from previous practices.

Sutphen Idle Reduction Offerings

- Here are some of the examples of Idle Reduction options that have been proposed or installed on recent builds.
  - Harrison 10K200 Diesel Idle Control System

  - Harrison hPower Lithium-Ion Battery System

Sutphen Idle Reduction Offerings - Continued

- Here are some of the examples of Idle Reduction options that have been proposed or installed on recent builds.
  - Kussmaul Xantrex, Lithium-Ion Battery System

- Zero RPM Idle Mitigation System

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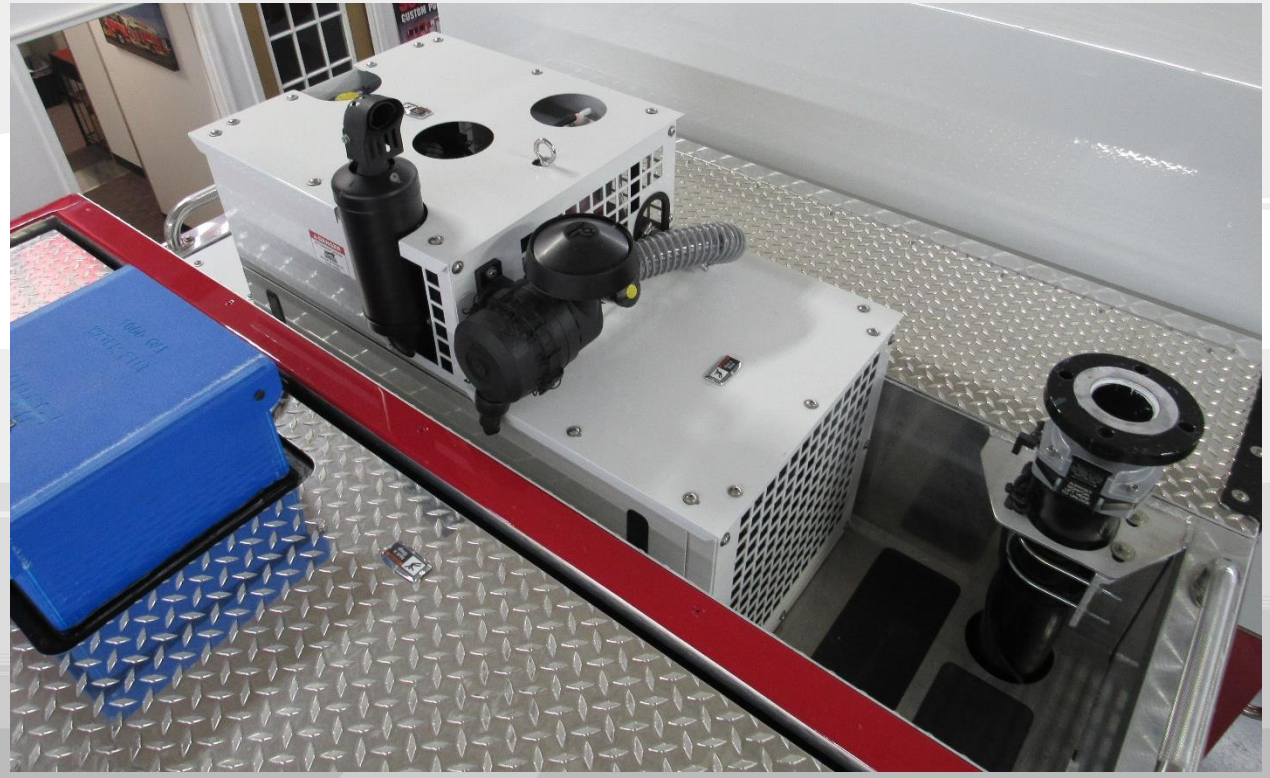
IDLE MITIGATION SYSTEMS®

Harrison 10K200 Diesel Idle Control System

- Installed on HS-6390 Durham, NC
  - Harrison 10K200 Diesel Idle Control System
  - Advantage is this system will maintain the chassis 12-volt DC electrical system by running both the AC Generator and the DC alternator simultaneously. This not only saves cost, but space for a dual style unit.
  - Disadvantage would be the noise level of the small diesel engine.



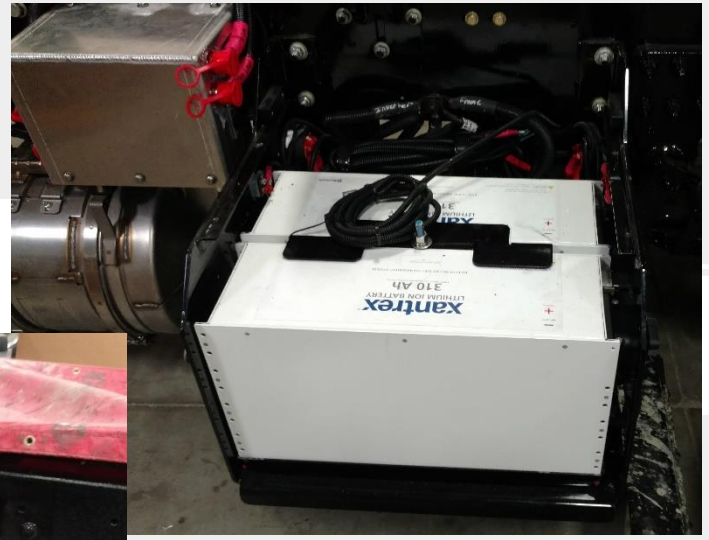
Harrison hPower Lithium Ion Battery System

- Installed on HS-6849-55 Durham, NC
  - Harrison 2B1C 275ah Lithium Ion Battery System
  - The following components are included with the ICS:
    - (2) LiFePO4 lithium iron phosphate batteries
    - (1) Battery Control Module
    - (1) System Control Module
    - (1) Battery charger
    - (1) External display
  - Advantage is small and compact, and practically no noise
  - Disadvantage is cost and length of use is limited

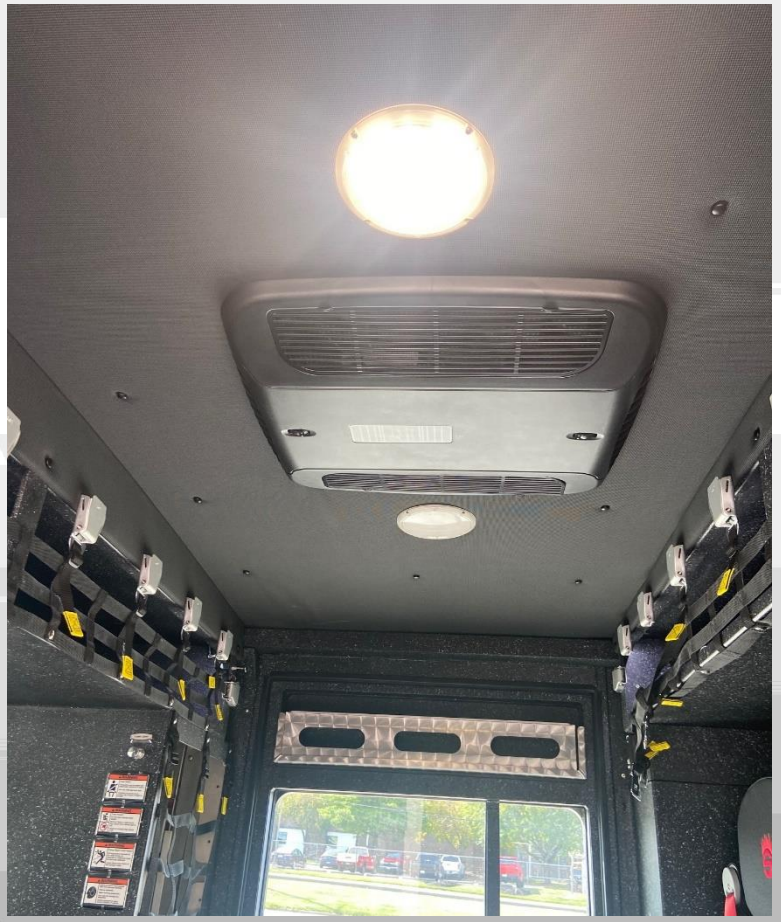
Kussmaul Xantrex Solar, Lithium Ion Battery System

- Installed on HS-6938 Clinton Twp, OH
  - Advantage would be cost. This is more labor intensive, and the components are less expensive than other setups.
  - Disadvantage would be no automatic transfer of power. This would be a manual. There are a lot more components to this setup than other offerings.
  - Components:
    - 120V SHORELINE INLET, KUSSMAUL SUPER AUTO EJECT-20 AMP
    - BATTERY CHARGER, KUSSMAUL, CHIEF CHARGER WITH REMOTE CONTROL PANEL- 60 AMP
    - BATTERIES, XANTREX, LITHIUM ION, 310 Ah (2)
    - ALTERNATOR, C.E. NIEHOFF, 415 AMP W/ 3RD GEN REGULATOR
    - SOLAR PANELS, 220W, FLEX (2)
    - KUSSMAUL INVENTOR, 3000W
      - INVERTOR TO RUN RV AC WHEN VEHICLE IS SHUT DOWN, MOUNT INVERTOR IN FRONT RAISE ROOF OVERHEAD COMPARTMENT TOWARDS THE DRIVER SIDE.
    - RV AIR CONDITIONER 15,000 BTU (INVERTOR)

Kussmaul Xantrex Solar, Lithium Ion Battery System



Kussmaul Xantrex Solar, Lithium Ion Battery System



Kussmaul Xantrex Solar, Lithium Ion Battery System

ZeroRPM Idle Mitigation System

- Only quoted, but can only be installed on Rescue Only builds.
  - Length of power provided without motor running?
    - Approximately 1-1 ½ hrs. (depending on the size of the system being used)
  - Time to recharge the system?
    - Approximately 45 minutes with engine at high idle. (depending on the size of the system being used)
  - What will be powered with the system?
    - All 12V loads on the vehicle that normally are powered by the engine running.
    - Also 110V loads thru an inverter (if installed).
  - Process of changing over from motor to batteries and back to motor.
    - When the vehicle is placed in park, the ZeroRPM IMS takes control of the vehicle and shuts off the engine.
    - At this point all loads will switch to run off of the Lithium energy. (lights, hand-held radios, laptop, AC etc.)
    - Once the batteries state of charge gets to the programmed set point the engine will automatically start to recharge the batteries.
      - In the event the driver is ready to leave the scene (before the low state of charge restart), the driver will press the brake pedal and the engine will start back up.
      - At this point the driver can put the vehicle in drive and move along.

Sutphen “Green Initiative” Summary

- Various Idle Reduction systems coming to market. All have a range in price, and components
- Current install systems can be powered at the station via a 20amp shoreline
- These system can help to extend the life of the Chassis, and reduce DPF regenerations
- Can reduce fuel consumption while the truck is in idle on scene depending on the setup

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Thank you!